Warner on space and time

1. Introduction

According to the myth of the 'Wizard Earl', in the early seventeenth century Henry Percy (1564-1632), the ninth Earl of Northumberland formed together with, Thomas Harriot (1560-1621), Robert Hues (c. 1560-1632) and Walter Warner (ca. 1557-1643) referred to as his 'Three Magi' the nucleus of a closely cooperating group of intellectuals. They would have waged a common war against Aristotelianism using as their main weapons atomism and Copernicanism.

In his biography of Thomas Harriot John Shirley in my view argued convincingly that there probably never was such a group.[1] This does not alter the fact that Henry Percy surrounded himself with people, who despite the fact that they did not explicitly cooperate, and that there never was such a thing as thé philosophy of the 'Northumberland Circle', shared a common background as well as anti-aristotelianism and a materialistic view of the world inspired by the cosmological ideas of a number of Italian natural philosophers from the final quarter of the 16th century, to wit Bernardino Telesio (1509-1588), Francesco Patrizi (1529-1597) and Giordano Bruno (1548-1600).

One of the most intriguing members of this group is Walter Warner, employed for the greater part of his life by Henry Percy as a sort of literary assistant. He is intriguing because of his reputation, his voluminous legacy of notes on all kinds of scientific subjects and because of his role as link between three successive intellectual milieus, to wit that of Walter Ralegh, i.e. the 'School of Night', in the 1580s, the 'Northumberland Circle' around Henry Percy from the early 1590s up to the early 1620s and the 'Cavendish Circle' around Sir Charles Cavendish (1591-1654) and his brother William Cavendish, Duke of Newcastle and patron of Thomas Hobbes, in the 1630s.

The scanty information about Warner suggests that he was a talented man.[2] Some deemed him a precursor of William Harvey (1578-1657), the discoverer of the circulation of blood. Hobbes put him, as optical scientist of European stature, on a par with the french scientist Claude Mydorge (1585-1647). According to John Pell, as a mathematician,

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[1]The three 'magi' only came together c.1615 and not until c.1617 a group was formed. Hill's participation in that group can not be substantiated. In 1618 Ralegh was executed and Harriot died three years later. Henry Percy was released in that year, 1621, from the Tower where he had been incarcerated for fifteen years. He retired to Petworth in Sussex. Warner probably stayed in London. (See Shirley (1949), 66.)

[2]See on Warner and these circles Aubrey's 'Brief lives', p. 291-293 ; Bradbrooke (1936); Jacquot (1952) and (1974); Batho (1960); Kargon (1966), p. 35-40; Shirley (1983), p. 358-379; Prins (1992).

Warner did not yield to William Oughtred (1574-1660), and he qualified him as a man 'proficient in all'.[3]

Warner's legacy consists of a large collection of notes, fragments of longer treatises, mathematical problems, calculations and tables plus a handful of letters. The papers cover a wide range of disciplines including mathematics, physics, physiology and psychology.[4] Apart from Rolleston's investigation in the 19th century of the claim that Harvey had his explanation of the circulation of the blood from Warner Warner's papers remained unnoticed for about three centuries.[5] Since the 1960s however they get more attention within the framework of the investigation of the history of atomism, of Harriot's papers and of the Hobbes-research. That is especially true for Warner's extensive notes on the principles of nature, viz. time, space, matter and force.[6] These notes are interesting for at least three reasons. Firstly, probably dating from the second half of the 1620s, they were written at a time when natural philosophy in England was put at back burner. Secondly, the few people in England studying that subject or writing on it were guided mainly by Aristotle's natural philosophy while Warner's views differ radically from that tradition. Thirdly, because they shed new light on the influence of Italian natural philosophy from the last quarter of the 16th century in England.

Until now the research regarding these notes was focussed on Warner's concept of matter[7] as well as on his notion of force.[8] I will take a closer look at Warner's attempts to formulate new notions of space, time, temporality and spatiality, show in what respects he dissociated himself from the peripatetic tradition, and discuss his main sources.

2. Space

In Warner' s day most philosophers subscribed to Aristotle' s theory of place.[9] According to this theory a thing's place is '...neither its form, nor its matter, nor a dimensional entity distinct from the dimensions of the entering or vacating body...' but '...the limiting surface

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[3]Warner edited Thomas Harriot, Artis analyticae praxis ad aequationes algebraicas nova, expedita, et generali methodo, resoluendas, Londini...anno 1631 and, assisted by John Pell, drew up an antilogarithmic table.

[4]The greater part of Warner's papers is collected in B(ritish) L(ibrary) Add. MS 4394-96.; BL Add. MS 4394, ff. 115-403; 4395, ff. 1-130, 132, 134-184, 191-212; 4396, ff. 1-82, 85-145; 4425, ff. 3-4; 4391, ff. 39-49, 52-62; 4279, f. 307; Sion College: Arc. L 40. 2/ E 10, f. 88. Copies, not of his own hand, of five tracts he most probably wrote but that are no longer extant: BL Add. MS Harley, 6754, ff. 2-74, 6755, ff. 3-14, 6756, ff. 1-4, ff. 5-23, ff. 24-6.

[5]See Rolleston (18884).

[6]See MS 4394: ff. 129r-130r, 382r-403v; MS 4395, ff. 191-212.

[7]See Kargon (1966), p. 5-42; Jacquot (1974); Henry ((1982); Clucas (1990.

[8]See Gatti (1983), 63-77, 152, 160, 148-9, 157 and (1985); Ricci (1985); Henry (1988).

[9]See Physics, IV, i-ix.

of the body continent - the content being a material substance susceptible of movement by transference.'[10] Being an accident of matter a place is always finite. Further Aristotle states '...that any and every place implies and involves the correlatives of 'above' and 'below', and that all the elemental substances have a natural tendency to move towards their own special places, or to rest in them when there - such movement being 'upward' or 'downward', and such rest 'above' or 'below'.[11] Hence, in Aristotle's view a place is not a figment but something real procured with active powers. The dynamics of natural motion only depend on the place where a things is. Consequently, if there is motion at a specific place there is no vacuum there for a vacuum has no directional properties. Accordingly, everywhere the containing and contained body are in contact and there are no empty places in the universe.

In a subset of his notes on the principles of nature, entitled ´Spacium, Locus, Ubi' Warner presents a totally different view. He describes space as '...corporeall or spherically infinit that is according to all dimensions and all local respects.'[12] It is filled with matter and force[13], absolutely continuous and eternal. Hence, space, in Warner's opinion, was not created.[14] Further, as the foundation of all motion, space is immobile itself and therefore not located for all that moves is in space.[15] As opposed to matter space is penetrable, yielding, and receptive, i.e. without resistance.[16] Further, space has no active power

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[10]Physics, IV, iv, 212a5. In the Categories Aristotle defines place, subsumed under the accident of quantity, not as a two-dimensional surface but as a part of space the limits of which coincide with those of the located body, i.e. as a three-dimensional entity. (See Categories, 5a6-14.)

[11]Physics, IV, iv, 211a1-5.

[12]MS 4395, f. 205.

[13]'Matter and virtue radiative do fill the universall space.' (MS 4394, f.386r) Warner shared the idea of the universe as a plenum with most of his contemporaries. Opinions only differed on what exactly it was filled with. Warner's belief comes closest to that of Cusanus in whose opinion space is filled with matter and 'spirit'. (See De docta ignorantia, lib. II, cap. 2.)

[14]Cf. '...both matter and vis though they may be both affirmed and conceved not to exist; yet they can not really not exist their existence having ben ab aeterno must necessarily aeternally continue.' (MS 4394, f. 129v); 'That matter is aeternall it is true...in respect of beginning and end...' (Op. cit., f. 382r)) In Warner's time these were bold opinions that could not be expressed without risking a serious accusation of atheism.

[15]According to Warner '...motion...is nothing but successive location...' (MS 4395, f. 191.)

[16]'It is absolutely penetrable,...cessible, capable or without...antitypia or resistance, and that in all his parts because homogeneall.' (MS 4395, f. 205); 'The very quiddity and proper essence of matter is corporeity or resistibility (or antitypia or hardness) for in that it is continuall or hath the thre corporall dimensions of longitude, latitude and profundity it agrees with space to which that condition doth properly or at lest primely belong...' (MS 4395, f. 212)

whatsoever or any positive qualities for that matter.[17] The latter, together with its simplicity implies that space is homogeneous and uniform.

The greater part of the properties of space are simply mentioned. Warner only explains its not being located and its infinity. The idea that space would be located itself is absurd and inconceivable as it would result in an infinite series of space in space. Moreover in that case something could be at more than one place at the same time in so far as it would be simultaneously in motion and at rest. Finally the idea of space as located itself is incompatible with the fact that space is not complex.[18]

As for its infinity Warner, in contrast with his scholastic contemporaries, believed that space essentially is and can not be conceived otherwise than as a magnitude or quantity abstracted from all matter.[19] Space and magnitude, in other words, are two different terms referring to one and the same thing abstractly considered. This implies that the principles of geometry, i.e. point, line and surface are applicable to space. Now the geometer postulates that a finite straight line can be produced infinitely.[20] Likewise, space can be extended in the imagination infinitely and that according to all dimensions.[21] For if the intellect would hit on a boundary that part of space would have to be different from the other parts which contradicts our idea of space as absolutely simple and homogeneous. Most people defended this idea with the argument that only infinite space is compatible with the infinite power of God ór that neither the senses nor the intellect give us reason to believe that there are cosmic boundaries.[22] Warner, leaving God and theology out of his natural philosophical speculations, shares his rather unusual argument for the infinity of the universe with Cusanus.[23] A second argument is right away directed against Aristotle's belief that there is no vacuum: 'Admit it be possible space to be finite and that without the limits or termes thereof there is no space and let the same space be full of matter in such sorte as within that space it can receve no more which is iust Aristotles concete of the world then unto that matter being finite there be adioyned more matter...which ether may be adioyned or may not be, yf it may be adioyned it must be adioyned ether within the space or without. within it can not for it is supposed to be so full as it can receve no more.

[17]Cf. Francis Bacon: '...place has no forces, nor is body acted on except by body...' (The Works V, 505.)

[18]See MS 4395, f. 205.

[19]Typical scholastic arguments against the idea that space is a three-dimensional interval are that such a space could not contain bodies, would be localized itself, and, being homogeneous would have no directional qualities.

[20]Cf. Heath' s edition of Euclid's Elements, book I, postulate 2: 'To produce a finite straight line continuously in a straight line.' (p. 154.)

[21]See MS 4395, f. 205.

[22]See Wolfson (1929), 215; McColley (1936), 409, 414.

[23]See Cusanus, op. cit., lib. II, cap. 1, p. 4-13.

then must it be annexed without and forasmuch all matter is contayned in space of equall dimensions with it self where that annexed matter is there shall be space and therefore space where there is no space which is impossible yf it can be adioyned there must be some thing to hinder it or keep it from taking place but nothing can keep matter out of place but matter (because two bodies can not penetrate one an other which matter must have place or space but it was supposed there was no space. which is likewise impossible. And so whether matter be supposed to be adioyned or that it can not be adioyned to matter filling [any] supposed finite space, there followes contradiction and therefore space can not be finite wherefore it must be concluded infinite...'[24] Ultimately Warner defines cosmic space as 'An infinite eternall nothing, but the universall vessell or receptacle of things.'[25]

In Warner's view space, like the other principles of nature, can not be known a priori. It also is imperceptible and not caused by anything else. In fact the principles of nature can not be known directly at all. We only can try to find out what conditions have to be fulfilled and what properties they must have if they are to account for our experience. Hence, according to Warner, we can not expect more of the theories concerned than that they 'save the phenomena'.[26] Thus, our idea of space and its existence are the result of a reasoning process or of a comparison. First we perceive some object. Next we remove that object actually or only in the imagination. Then we concentrate on that place or space perceived as completely empty and apply the form, boundaries and quantity or dimensions of the removed body to it. This way to acquire a notion of the vacuum was well known and widely used, by modern as well as traditional philosophers, in Warner's day. The crucial difference with many of his scholastic colleagues however, is that with them this procedure resulted not in the notion of something that really has extension or dimensions but in the notion of what they called 'imaginary space', i.e. something that only seemingly prefigures the dimensions of the bodies it can receive.[27]

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[24]MS 4395, f. 206. See for this argument also Lucretius, De rerum natura, I, 951-1051.

[25]MS 4395, f. 205. Cf. Barrow's definition of space as '...nothing else but the mere power, capacity, possibility, or...interponibility of magnitude.' (The usefulness of mathematical learning, 176) Barrow presents this idea as a 'common conception' '...engraven in the imaginations of all mortals' (op. cit., 165.)

[26]Cf.: 'Seing...that the cheef condition of this vis in generall is to cause locall motion...it resteth to consider the maner how it is to performe the same and what other conditions it ought to have for the salving of all apparances the knoledge of which conditions is all the light we possibly can attaine to of the essence and quiddity thereof and the like is to be understood of mater time and space.' (MS 4394, f. 389v)

[27]See Suarez, Opera Omnia, Vol. 26, pp. 974-975). Cf. Bruno: '...vacuum licet physice vere, realiterque sit separatum, tamen a corporibus non est, sed ratione dictitante concipitur. Concipitur autem per analogiam corporum eodem in spacio succedentium...' (Camoeracensis Acrotismus, Book 4, pp. 142-143. In Opera latine conscripta I 1) Likewise Warner states that '...this apprehension is confirmed or habituated or rectified by reiterate application of an other body equall and like unto the same space imagined, to succeed or of

3. Time

According to Aristotle time can not be disconnected from change or motion in so far as we only become aware of the passing of time when we experience changes.[28] There would be no time if we would not notice the difference between the successive nows. Time, neither identical with nor separable from motion, is the '...calculable measure or dimension of motion with respect to before- and afterness.'[29] Time is that '...by which movement can be numerically estimated.'[30] In fact time and motion are mutual measurements. Now all motion is measured by the eternal rotation, obvious to everyone, of the sphere of the fixed stars. Likewise time depends for its nature and existence on the movement of the primum mobile. Hence, we measure time by the movement of the heavens.[31]

Warner did not collect his views of time in a subset of notes entitled 'Duration, frequency and when'. Yet, dispersed through his papers are numerous statements concerning time that, collected and ordered, turn out to constitute a detailed and coherent theory. Like space time as such can not be known for it is imperceptible. Only the perception of things in motion or at rest gives us an idea of time. Especially motion for the time seen to be passing in that motion can be divided by dividing the length of the space traversed by the moving body.[32]

Considered with respect to things time, says Warner, is 'the prime attribute reall to all other things'.[33] Consequently, strictly speaking nothing can be attributed to it; not even that it is and therefore not even that it exists. So it is not easy to characterize time. Yet Warner makes an attempt. Like space time considered in itself is an autonomous principle, imperceptible and infinite. It is absolutely eternal and continuous, i.e. it is not composed of

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the first imagined to returne.' (MS 4395, f. 205.) See also Grant (1981).

[28]Physics, IV, xi, 218b20-25.

[29]Physics, IV, xi, 219b1. Aristotle continues: '...And since time is the measure of motion, it will also incidentally be the measure of rest; for all rest is in time.' (Physics, IV, xii, 221b7-10.)

[30]Physics, IV, xi, 219b3-4.

[31]Physics, IV, xiv, 223b20-25. See also Hutton (1977), 346-347. In Aristotle's cosmology the sublunar world, i.e. the world of change and transience, is made out of fire, air, water and earth, each of which has its own, rectilinear motion.The heavenly bodies, consisting of ether, are eternal, unalterable and have a circular, i.e. perfect motion. Apart from the first unmoved mover, God, all that moves is set in motion by something else and the first moved mover is the sphere of the fixed stars whence the motion is carried over to the lower regions. (See Aristotle, On the heavens, I, ii-iii.)

[32]See MS 4395, ff. 202-3. Warner wonders '... whether the nature of time may be apprehended otherwise then by motion ether of some obiect externall or at lest without internall motion of the spirits...' (MS 4395, f. 202)

[33]MS 4395, f. 202; 'an adiunct or accident of things comprised in time' (MS 4395, f. 192.)

really distinct parts and consequently also constitutes a unity.[34] It has absolutely no active power and exists independently of other things.[35] Warner stresses that when he says that time exists he does not only mean the present, a moment without dimensions, but also the past and the future. In fact this '...ought to be understood in the enunciations of all other things where there is any consignification of time or els there will be found no affirmation clere from contradiction or falsity.[36] Time measures and determines the duration and frequency of the being and non-being of things.[37]

As to time, says Warner, we are primarily interested in the differences between durations and frequencies of different events. That requires a common measure to compare them. This can only be done with the help of a time accompanying a motion that not only is equable and perceptibly divisible but also holds good for all places and times: 'Such kinde of motions must ether be devised by art or found in nature. By art there may be divers motions made having the two first conditions of divisibility and equability as by runnyng of sand or water...But to have also those other two properties of generality and perpetuity they must of necessity be naturall as the pulse of the hart or the course of a river or celestiall motion: But of all motions whether artificiall or naturall that of the sunne both annuall and diurnall as only having in perfection all conditions required hath by secret consent bin receved of all nations in all ages for the fundamentall and famous mesure of all beings or not beings, [...] motions or quiets of things.' Warner cautions in this connection against the 'celestial reduction' of time: 'By often and variable application whereof and by

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[34]The fact that our knowledge of time requires motion implies that we apprehend the continuity of time only through the continuity of space, i.e. as a line. (Cf. Barrow: 'Time has many analogies with a line...for time has length alone, is similar in all its parts, and can be looked upon as constituted from a simple addition of successive instants or as from a continuous flow of one instant...' The geometrical lectures, 37.) In fact, says Warner, '...the continuity of time in truth and existence and abstractly considered is of an other quite different kinde innominable and scarsely per se et primo phantasible.' (See MS 4395, f. 210)

[35]MS 4394, f. 401v.

[36]MS 4395, f. 194. Cf. 'Instantaneall existence is no existence in respect of time, punctuall existence is no existence in respect[ence] of space.' (Ibid.); '...for an instant of time any thing may be understood and affirmed both to exist and not to exist but there can be no state of that existence or non existence but during some time.' (MS 4394, f. 129v-r) See also MS 4395, f. 195.

[37]'In mesuring continuance it is principally accomodated to the being of things whether in quiet or in motion as how long such a thing doth last or exist, or how long such a thing is in motion and this Aristotle and Proclus call Primum tempus being nether gretter nor lesse than his subiect but beginning when it begins and ending when it ends. (Cf. Aristotle'...when we speak of the time 'in' which a change occurs, we may mean either the 'primary' or proper time coinciding with the change or a longer period including the proper time...' (Physics, VI, vi, 236b19.)) It is also applied in an other sort as when we aske when such a thing ether was or will be and in this case it seemeth to mesure the not being of things and this is that which Aristotle maketh the predicament of quando...' in connection with which he defines time as the number of motion with respect to the before and after. (MS 4395, f. 203. See also Aristotle, Categories, 2a2 and 11b10.)

hearing it applied there is such a habit generally bred in the fancies of men that in applying thereof they seeme not to apply it as motion but abstractly even as time it self without any conceit or cogitation at all of the subiect...' [38] Time, in other words, is measured by but should not be identified with the motion of heavenly bodies.

4. Space and Time

Unlike his more traditional colleagues Warner also systematically compares space and time. First of all he investigates the question whether they exist at all and if they can be said to exist how this has to be understood. That investigation comes down to an analysis of the concepts at issue as well as of our ways of speaking about space and time.[39]

'Time and space are subiect to non existence only in speech but nether in concept nor reality...'[40] Yet: 'Space and time have debilem entitatem yf they have any positive being or existence at all; that reality which they have extra intellectum [is] seemes to be nothing but quantity but in different or contrary maners for time is quantum primo et per se, fluens, sive in transacto sive in potentia; space is quantum primo et per se stans vel permanens actu; time with relation, space without or absolutè.'[41]

The next question is what we mean when we say that they exist and how they are related in that respect. Meaning by existence 'the correspondence that a thing reall and extra intellectum hath to the concept thereof in intellectu...time or space (may) be said...to exist...'[42] Warner formulates different answers as to their relationship. If they exist at all then probably not in the sense of 'being contained in space' for, as was said before, space can not be said to be in space without leading to an infinite regress while time, being of a totally different dimension, can not be applied to space at all. Anyway, if it is contained in space than not according to spatial extension. So, probably '...time being the more prime ens doth rather mesure and contayne space then space time...' Hence, in Warner's view, there is no spatial aspect to time but space, having duration, is temporal.[43]

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[38]MS 4395, f. 203. Cf. Galen: '...motion does not produce time for us; it only produces for us days, months and years. Time, on the other hand exists per se, and is not an accident consequent upon motion.' (Quotation from Ibn Abi Said by Sambursky (1987), 102)

[39]Cf.:'...how we apprehend it {i.e. time} per signum by the worde time which per se is nothing but an articulate sounde and hath no affinity in the world with [time] the thing it signifies.' (MS 4395, f. 203)

[40]MS 4394, f. 403v and f. 400v. Warner adds that not as measures but only as determinants of where and when space and time can be said to exist in a point or in an instant. Cf. the quotations in note 37.

[41]MS 4395, f. 205.

[42]MS 4395, f. 202. Warner wonders in this connection whether the same is also true for 'continuity', their common attribute, and even whether this property exists prior to space and time. (See MS 4394, f. 401r)

The idea that space and time exist is plausible in view of the fact that '...it may be douted whether that which is the foundation and doth give denomination to an other thing of existence may not it self multo magis be said to exist quod efficit tale est magis tale.'[44] The question is how to prove this. It '...can not be proved a priore or directly, but only a posteriore or indirectly by deduction ad impossibile, [...] the non existence of them to a contradiction of the sense or phaenomena, unless it may be counted a sufficient proofe a priore...that the mynde can not imagine it not to be, as to him that so doth conceve it doutles it is, for to prove a thing to be, is nothing but to cause the mynde...to conceve or apprehend it as a thing really being, that is to say to know or be assured that unto the intellectuall concept or phantasme there is a thing without the fantasy really existing answerable and congruent thereto. Moreover the essence or quiddity thereof can not be conceved, but the reality and existence must necessarily be also conceved, so that it is impossible for a man to dout of the existence of time or space understanding only what is ment by those names but that he must needes contradict his owne conscience.[45] A posteriore it will easely be proved for unles there be time and space there is nothing for in affirming a thing to be we affirme it only to possesse some space distinct from all other things and be possessed of some time concurrent with all other things.'[46]

Apart from the fact that space and time can not be thought not to exist both of them are absolutely continuous and consequently not really divisible.[47] We divide time intellectually in past, present and future, before and after, and space sensorially in here, there, top, bottom, left, right, etc. Further, being '...things of absolute simplicity and void of all difference in themselves...' time and space are '...unapt to be occasion of difference in other things.'[48] Finally, just like space time can be conceived as having three dimensions depending on the number of different states of things it is applied to simultaneously.[49]

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[43]Cf.: '...time it self can not proprely said to be in it self...' (MS 4395, f. 193) Yet he also wrote '...in every point of the universall space the time that is the whole eternall time in the whole infinit space and in every indivisible point thereof and as truly in any one point as in the whole...the whole infinit space in time whole eternall and infinit time and in every indivisible instant thereof the same and as [...] truly (and alike) in any one instant as in the whole eternity...' (MS 4395, f. 196.)

[44]MS 4395, f. 194.

[45]Cf. More: '...that necessity of Existence that seems to be included in the Idea of Space is but the same that offers it self to our Mind in that more full and perfect Idea of God.' (A Collection, 163.) See also Baker (1930).

[46]MS 4394, f. 400v.

[47]MS 4395, f. 210.

[48]MS 4395, f. 197.

[49]See MS 4395, f. 203. See also note 82.

The main differences between absolute space and time are that while the parts of time constitute an infinite succession, the parts of space constitute an infinite extension[50] and while time changes continuously space is necessarily immutable.[51] The most interesting difference regards their order. While according to most philosophers in the hierarchy of being space is prior time Warner considers time as the absolutely first principle: 'Yf unto time and space be ascribed any kinde of being whether reall or only conceptuall (or analogicall for that which is conceptuall is in some sorte also reall) it is certaine they are in respect of being more prime then materia and vis and though not tempore yet natura, and time more prime then space because time is applicable to space by way of predication and not econtra.'[52]

Things are subjected to time and contained in space. Warner discusses the differences between space and time with relation to things in three respects:

Being in space and time - What does it mean temporally and spatially to say that something does or does not exist ? When a thing does not exist in time it also does not exist in space but the reverse is not necessarily true '...which argues the priority of time.'[53] Further, when we say that something has a certain size or occupies a certain place we are not so much talking about the existence of that thing as about the thing itself. When something is said to exist than it exists necessarily in the whole time while it can not but occupy a part of space as it can not be in more places simultaneously '...or rather it is impossible to be conceved otherwise.'[54] A natural thing, in other words, always has a finite size or occupies an absolutely limited part of space while its duration only relatively seems to be connected to a specific part of time. It does not exist absolutely in the present, past or future but in the unlimited time as such and only depending on where we stand on the line of time we perceive that as past, present or future.[55] Moreover, when we say that

[50]See MS 4395, f. 196.

[51]Ibid.

[52]MS 4394, f. 400v. Interesting in this connection is Isaac Barrow's view that time as a necessary condition of existence exists itself in and before empty space. (See Baker (1930), 16)

[53]See MS 4395, f. 196. Cf. Simplicius: '..aliquibus videtur, q. huic ordini assentiendum sit, & dicunt q. omne quod movetur, in tempore & in loco movetur, & quod prius est quando, quam ubi, quia nullum generabile potest esse, neque fieri, neque fore, sine tempore, tamen multa sint sine loco, sicut ipsemet locus, & actiones, non sunt in loco, sed in tempore, quamvis agens sit in loco.' (See Simplicius, 144.)

[54]MS 4394, f. 400v.

[55]'...there seemes this difference in the mensuration of time and space that every finite part of matter which is proprely said to exist that existence is aeternall that is in respect of time infinit but the existence thereof in respect of space is finite. So that time doth mesure the existence of things whether they be finite or infinit infinitely but space sometimes finitely sometimes infinitely which difference may be understood to arise rather out of the nature of the things themselves then out of any naturall diversity in time and space.' (MS 4395, f. 195)

something exists we suggest that it exists now and not in the past or in the future while we say nothing about where it exists. Some of these differences neither flow from a natural distinction between space and time nor from the nature of the things in space and time but are related to our linguistic usage. Warner dwells in this connection on the temporal connotations of the verb 'to be' or 'to exist'. These verbs imply the present while they do not suggest anything about the spatial aspect: '...this point of adsignification of time and not of space in all verbs where there ought to be as there is in the things an indifferency is a pregnant occasion of many errors concerning time and space by reson of the instance of language which is of all anticipations the strongest and most unremoveable.'[56] Consequently Warner pleads another use of the verbs at issue or the invention of new words enabling us to express the thought of the existence of something as such without indicating or suggesting a specific part of time.

Moving in space and time - As things are said to pass in time they also traverse space. In that respect there also are a number of differences between space and time. While the transition from one part of space to another implies a change of the thing itself, namely a translation that same thing does not have to change at all to go from one part of time to another. Such a transition is caused purely by '...the lineall successive progresse (or the nature) of time...'[57] Moreover, in opposition to a change of place, the transition from one part of time to another is not arbitrary, accidental or contingent but is and can not be conceived otherwise than as necessary. Apart from that, as opposed to those in space transitions in time are irreversible.[58]

Time, considered as an accident of things in time, differs, says Warner, from other accidents. The latter can be absent or present without necessarily affecting the existence of the thing itself. The same is not true for time. A thing's temporality implies that it comes into existence, flourishes and passes away.[59] Of course the same holds good for space but Warner does not mention it in this connection.

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[56]MS 4395, ff. 194-5. These thoughts were probably inspired by Aristotle who states that the problem of the existence of time flows from the Greek notion of 'being' meaning 'being present'. (See Physics, IV, x-xiv and Book VIII, viii.)

[57]MS 4395, f. 192.

[58]Ibid. Finally Warner mentions as a difference that the relationship between space and things is mutual in so far as just as a thing can occupy successively different places a part of space may receive successively different things. The same is not true regarding the relationship between time and things. Different things can be subjected to the same part of time simultaneously but different parts of time can not be simultaneously be an accident of one and the same thing. (See MS 4395, f. 192)

[59]Ibid.

Temporality and spatiality - Time as well as space measure and determine the being of things.[60] Or rather ‘States of things are modified or diversified or specified by space but mesured and determined by time, as the state of existence by being in space in generall and the state of existence further particularized by being in this or that particular space...’[61] Finally we also read in his notes that 'Time is the mensurant and determinant of states, place the continuant and distinguent.'[62] Warner apparently believes that things of themselves háve a duration measured by time while they are and stay in a distinct state only thanks to space. As for the state of non-existence '...it seemes repugnant to the nature of the intellect to conceve things but necessarily sub ratione quanti or spaciosi (and also sub ratione temporis for the very act of conception is temporall of necessity.) So that when we seeme or affirme to understand a thing non existent in space or not to be of such a space, we properly conceve not the thing but space simply or such a space void and unpossessed of anything and the like of time.'[63]

5. Warner’s sources

Warner's ideas about space and time, formulated in the early 17th century and differing radically from the Aristotelian tradition, point to the notions of absolute space and time as formulated by Newton (1642-1727). Yet, it would be wrong to consider him on that account as a radical innovator and original thinker for in all probability he took most of the ideas concerned from the writings of Bernardino Telesio, Francesco Patrizi and Giordano Bruno, the leading Italian natural philosophers from the last quarter of the 16th century. Their works, effecting the final emancipation from Aristotelian thinking on space and time in terms of the 'substance-accident scheme' and towards the notions of absolute space and time, played a major role in the break-down of the Aristotelian world-view and consequently in the rise of modern philosophy.

The Italian natural philosophers developed a number of comprehensive systems in reaction to Aristotelianism and based on the idea of the universe as an autonomous unity in the sense of a cosmic organism or an 'animated mechanism'. Warner's debt to these philosophers does not make his work less interesting. On the contrary. His notes suggest that we might have to reconsider our idea of the development of the notions of absolute

[60]Time measures all states in the same way. Space measures motion as a line and rest in three dimensions. (See MS 4395, f. 195)
[61]MS 4394, f. 400r.
[62]MS 4394, f. 400v.
[63]MS 4395, f. 196.

space and time in England and especially our ideas regarding the influence in England of Italian natural philosophy.[64]

Telesio rejects Aristotle's definition of place and can think of no reason why space can not exist apart from matter. In his view space, differing radically from bodies, is nothing but the place of all bodies and the necessary condition for their existence and motion. It is imperceptible and only considered with relation to bodies we discover its properties. Further, space is essentially empty but actually full and it can receive bodies precisely because it is incorporeal itself. It is indivisible and homogeneous; immobile and immutable and without any action or operation. As the power to receive bodies space is a non-being. Yet, it is said to exist per se. With the expression 'per se' Telesio suggests that he conceives space as a substance but he does not say so explicitly.[65]

Patrizi, whose concept of space in other respects is very similar to that of Telesio attributes more positive qualities to space and has more to say about its ontological status.[66] Space, created by God before all other things, is homogeneous and immobile. It is penetrated by bodies and penetrates the dimensions of bodies. As resistance is characteristic of bodies space is essentially yielding. It also is essentially empty and imperceptible. It is not to be subsumed under the Aristotelian category of quantity for it is an independently existing, infinitely extending three-dimensional continuum supporting and making room for the movement of the substances it receives, locates and surrounds. Hence, space also has active powers. It is corporeal in so far as it has three dimensions and incorporeal in so far as it offers no resistance.

In its turn Bruno's concept of space is very similar to that of Patrizi.[67] However, there are at least two important differences. First, as opposed to Patrizi Bruno did not distinguish between a finite, spherical cosmos located in an infinite, empty space with the world for its centre but conceived the universe as an infinite space filled with infinite worlds. Further, as opposed to Patrizi Bruno deems space not penetrable for, being absolutely continuous it is indivisible. Most philosophers considered space penetrable in the sense that it does not resist bodies and so does Patrizi but he, as we saw, goes one step further deeming space not only penetrable but also ‘yielding’.[68]

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[64]See Fierz (1954), pp. 75-85 and Baker (1930).

[65]See Telesio, De rerum..., Book I, chaps. 24-25.

[66]See Patrizi, Nova..., Pancosmia. Book I and II.

[67]See De immenso et innumerabilibus, pp. 231-233 (In: Opera latine conscripta I 1, I 2) and Camoeracensis Acrotismus, p. 126 (In: Opera latine conscripta I 1)

[68]Kretzmann deems to yield and to penetrate incompatible in so far as penetration goes with a continuous, homogeneous space while space can only be said to yield if it is discrete. Perhaps, says Grant, Patrizi understands by 'cessio' a kind of 'penetration', i.e. enabling a body to move freely through space. (See Grant (1976a), p. 166, note 105)

Again, the most fundamental and decisive criticism of Aristotle's notion of time came from Telesio, Bruno and Patrizi.[69] All three deemed time independent of motion or of whatever state of beings. Time is no accident of a thing. Telesio considers time as something existing per se and not motion is the measure of time but time that of motion. Time is the receptacle of motion and as such precedes it. Yet, motion and change are indispensable to become aware of time.[70] Time, says Bruno, is duration and he contrasts it not with motion but with space. The latter is stationary while the former flows. He refers to time and eternity as finite and infinite duration. They do not differ in quality but only as species and genus. Finite time depends on motion for its existence, infinite time does not. Time can be determined as well by artificial as by natural motions.[71] Patrizi reproaches Aristotle with chaining time to motion, describing it as 'number' as if it is an imaginary thing and with ascribing eternity to it. He follows Telesio in his idea of time as a sort of duration, or rather, as he says himself a permanence of things.[72]

As for the influence in England of Bruno's ideas on the rise of modern philosophy in the 17th century opinions are divided. There is no doubt however that those of Telesio and Patrizi played an important role in the development of the notions of absolute space and time . Yet, according to most historians Italian natural philosophy from the last quarter of the 16th century hardly had any direct influence in Engeland.[73] The ideas at issue would have been introduced in England by the late 1640s mainly through the writings on atomism of Pierre Gassendi (1592-1655).[74] Warner's notes on space and time seem to belie this theory. They strongly suggest that Warner knew the literature concerned very well and used it demonstrating thus that, in England, the thinking about the notions of absolute space and time, i.e. notions fit for a mechanical explanation of nature derives directly from Italian natural philosophy and started earlier than is generally assumed.

Of the philosophers who rejected Aristotle's cosmology in the 16th and 17th century some adhered to the atomistic view of the universe as an infinite space, an actual infinity, partly filled with matter. The majority opted for the Stoic view of a spherical, finite cosmos,

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[69]See Ariotti (1973); Hutton (1977); Capek (1987); Schuhmann (1988).

[70]See Telesio, De rerum natura iuxta propria principia. Lib. I, cap. XXIX, pp. 224-226.

[71]Camoeracensis Acrotismus, Book 5, pp. 146-150. (In: Opera latine conscripta I 1)

[72]See Hutton (1977), 358-359.

[73]Opinions differ as to the influence of Bruno's cosmology and atomism in Engeland and its hard to determine anyway. (See Grant, (1981)) Telesio is only extensively discussed by Francis Bacon who rejects his cosmology. (See The Works, V, 490-497) Patrizi gets the best of it but then primarily not as a natural philosopher but as a moral philosopher, historian and anti-aristotelian. (See Whitaker (1968), Henry (1979), Grant (1981))

[74]See Grant (1981); Schuhmann (1988); Rochot (1956). See for Gassendi's views on space and time Syntagma philosophicum (1658). Pars secunda, quae est physica: Liber secundus De loco, et tempore, seu spatio, et duratione rerum. In: Opera Omnia, Band I: pp. 179-228.

completely filled with matter and surrounded by an infinite, three-dimensional vacuum. Warner, on the one hand seems to side with the atomists in so far as he considers space infinite; on the other he shares with the Stoics the idea that this space is filled. In his opinion it is filled with material particles and a so-called 'virtue radiative' setting these particles in motion.

His views of space, though very similar to those of Telesio and Bruno, seem to be inspired primarily by those of Patrizi. Both deem space essentially a vacuum that is penetrable ánd yields to bodies. Further, both oppose space to matter as something that is not only accidentally procured with dimensions but is essentially a quantity.[75]

In opposition to Patrizi Warner denies that space is absolutely first, was created, is a body and that it has active powers. Warner also does not distinguish explicitly between physical and mathematical space. Like he says hardly anything about the precise relationship between mathematics and physics Warner does not elaborate on the how and what of the application of the principles of geometry to space. He deals extensively with the question of how to prove that space exists but is almost as vague about its ontological status as Telesio was.[76]

In contrast with Patrizi Warner also discusses the ubi, the 'where' as scholastic translation of Aristotle 's to pou, i.e. the predicament in answer to the question where something is.[77] His remarks as to that, based on the traditional Aristotelian distinction between the topos idios or proper place and the topos koinos, i.e. common place are interesting for what they tell us about his sources, his interpretation of Aristotle and about his secular approach to science: '...place is ether taken for that space that agreeth iustly with the thing placed or contained in it and in this sense Aristotle ascribeth it to the predicament of quantity and in his physiks (as also Proclus) calleth it Locus primus...An other consideration there is of place as Aristotle considers it in the predicament of ubi without regard of precise congruence.[78] In the first sense things are said to be in Loco

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[75]In Warner's day there were about three different answers to the question whether space is a quantity or not. Most scholastics, and even Telesio, the first of the moderns explicitly denied that space is a mathematical entity. Others, to begin with Aristotle considered space a quantity implying that it is an accident. (See Grant (1981)) Patrizi, however, conceived space not as a substance or an accident but as three-dimensionality as such.

[76]Remarkable in this respect is that Warner like Telesio and as opposed to Patrizi qualifies space almost only in negative terms. (See Leijenhorst (1993), 59)

[77]See Grant (1976).

[78]MS 4395, f. 205. Cf. Aristotle: 'Place, again, is one of the continuous quantities. For the parts of a body occupy some place, and they join together at a common boundary. So the parts of the place occupied by the various parts of the body, themselves join together at the same boundary at which the parts of the body do. Thus place also is a continuous quantity, since its parts join together at one common boundary.' (Categories, 5a6-14); '...a 'place' may

repletivè in this sense definitivè. And although in this consideration of place things can not but replere locum yf they be materiall or howsoever quantae yet in respect of this present intention it is per accidens and it suffizeth yf they be comprehended howsoever within the limits of a determinate place as a buck in a park or a bed in a chamber.' [79]

Understanding by ubi the relationship between a place and the thing it contains theologians distinguished between ubi circumscriptivum (the 'where' of material, filling bodies) and the ubi definitivum (the 'where' of immaterial bodies such as angels and souls).[80] Giordano Bruno adopts this distinction and divides the ubi circumscriptive further into the usual proper or first and common place, referred to by him as the adequate and inadequate place. God is nót in loco circumscriptive but definitive and repletive.[81] Now, Warner secularizes this distinction using the terms repletive and definitive in the sense of Bruno's adequate and inadequate circumscription, i.e. the proper and common place of material things.[82]

Despite the fact that Warner's notion of place does not differ essentially from that of his Italian colleagues and thus is radically opposed to Aristotle' concept of place Warner not only seems to ignore most of their detailed criticism of Aristotle but even attributes his own idea of place as a three-dimensional entity to Aristotle. Moreover he unjustly suggests that the neoplatonist Proclus (410-485) held the same notion of space as Aristotle.[83]

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be assigned to an object either primarily because it is its special and exclusive place, or mediately because it is 'common' to it and other things, or is the universal place that includes the proper places of all things...But if what we mean by the 'place' of a body is its immediate envelope, then 'place' is a limiting determinant, which suggests that it is the specifying or moulding 'form' by which the concrete quantum, together with its component matter, is 'determined'. (Physics, IV, ii, 209a34-209b4) ; Proclus: 'Since place is neither the form of the things in place, nor the matter, nor the boundary of the encompassing body, it remains only that the extension between the boundaries of the encompassing body should be conceived as the primary place of everything.' (Simpl., Phys., 611, 10-618, 25. Quoted by Sambursky (1987), 65.)

[79]MS 4395, f. 206.

[80]Something is said to be located circumscriptively if it is located in such a way that it occupies the whole place and that each part of the object corresponds to a part of that place. The ubi definitivum only regards immaterial substances, i.e. substances without extension an hence strictly speaking unable to occupy a place. They are located as a whole in the whole place and as a whole in each of the parts of such a place. (See Suarez, Vol. 26, 1003)

[81]See Bruno's Summa terminorum metaphysicorum, pp. 24, 66-67. (In Opera latine conscripta I 4)

[82]I hit on this interpretation only with Walter Charleton, writer of the Physiologia-Epicuro-Gassendo-Charltoniana (London 1654), a translation and expansion of Gassendi's Animadversiones in decimum librum Diogenis Laertii (1649). (See p. 70) See for his ideas about space and time in general Physiologia, Book I, Chap. 5, sect. 3, pp. 22-3; Chap. 7, sect. 1, pp. 72-6. The most striking similarity with Charleton is the idea that time in a way has also three dimensions.

[83]Warner's reference to Proclus as well as his suggestion that Aristotle's definition of place in the Physics does not differ essentially from that in the Categories point to the commentaries on Aristotle's Physics by the sixth century commentators Simplicius and Philoponus, widely read, usually in a latin translation, in the 16th century. (See Schmitt

As opposed to his notion of space (and certainly that of matter) Warner's notion of time shows no traces of atomism whatsoever. Like the Aristotelians the atomists held a relational concept of time: '...time itself does not exist; but from things themselves there results a sense of what has already taken place, what is now going on and what is to ensue.'[84]

Warner's concept of time as something that 'hath being only in it self and in its owne parts praeterito praesenti et futuro'[85] comes closest to that of Telesio and Bruno. Like Telesio he believes that time, considered as a cosmological principle, can only be measured by motion and yet as duration is prior to motion. With Bruno he shares the idea of time as something in motion as well as the distinction between finite and infinite time instead of that between time and eternity. His references in this connection to Aristotle and Proclus suggest again an influence of neoplatonic commentaries from the sixth century on Aristotle's Physics.[86]

6. Conclusion

In his notes on the principles of nature Warner does not present a finished theory of space and time. They constitute a snap-shot of scientific work in progress. In fact he attempted the near impossible in so far as he tried to determine the properties of space and time in spite of his conviction that these principles can hardly be conceived or known. So it does not have to come as a surprise that he is rather ambivalent as to their ontological status. On the one hand he states that they are objectively, independently existing entities preceding matter; on the other he characterizes them as accidents, duration and magnitude, of things without clarifying this distinction adequately from an ontological point of view.

This does not alter the fact that Warner clearly breaks with the scholastic tradition and, as well in his views of space and time as independent principles as in his dealing with them as a 'pair of twins'[87] anticipated the modern notions of space and time as formulated

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(1987) and Algra (1988), pp. 100-105)

[84]Lucretius, op. cit., I, 459-463.

[85]MS 4394, f. 401v. Cf.: 'Both time and space are entia realia and have their severall essences not only depending of the concept but in rebus ipsis extra intellectum.' (MS 4394, f. 400v)

[86]See notes 39, 54 and 85.

[87]Maybe Warner, as to this, was also inspired by Telesio. He did not yet go as far as Gassendi who considered space and time as equivalent entities. Gassendi is supposed to have been the first to compare parts of time in space and vice versa. (See Schuhmann (1988).)

by Newton.[88] Hence, it also goes without saying that his ideas are very similar to those of Gassendi and even more to those of Walter Charleton (1620-1707).[89] Though Warner does not add much of his own to the views of the Italian natural philosophers his notes on space and time are important in so far as they shed new light on the influence of these views in England. They show that this tradition, Patrizi's ideas about space and Telesio's theory of time in particular, was not introduced in England, as most historians seem to believe, only by 1640 and mainly through Gassendi's work but met with a response directly and much earlier in the 17th century. Yet, the relevant publications in England during the first decades of the 17th century suggest that Warner stood as good as alone with his views and especially with those on time. In fact there probably were kindred spirits and it would be worth the effort to investigate the unpublished papers of contemporary fellow-countrymen, preferably people he associated with as a member of the several 'circles' mentioned before. Likewise more research should be done into the diffusion of his natural philosophical ideas and into the influence they might have had in England on the thinking about space and time since the 1640s

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[88]'Absolute, true, and mathematical time, of itself, and from its own nature, flows equably without relation to anything external, and by another name is called duration: relative, apparent, and common time, is some sensible and external measure of duration by the means of motion, which is commonly used instead of true time; such as an hour, a day, a month, a year...Absolute space, in its own nature, without relation to anything external remains always similar and immovable. Relative space is some moveable dimension or measure of the absolute spaces; which our senses determine by its position to bodies; and which is commonly taken for immovable space...absolute and relative space are the same in figure and magnitude...' (Newton, Principia, 6.)

[89]See note 84.

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